JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2025

Ph.D.-I Semester (CSE)

COURSE CODE (CREDITS): 22P1WMA231 (03)   MAX. MARKS: 35

COURSE NAME: APPLIED SOFT COMPUTING TECHNIQUES

COURSE INSTRUCTORS: ARV   MAX. TIME: 2 Hours

Note: *(a) All questions are compulsory.*

(b) The candidate is allowed to make Suitable numeric assumptions wherever required

for solving problems

Q.No	Question	CO	Marks
Q1	Explain why fuzzy logic uses min, max, and $1-T(P)$ for AND, OR, and NOT operations instead of classical Boolean logic.	3	4
Q2	How to derive the fuzzy rule: *If x is A or y is B then z is C* Given two separate fuzzy rules: 1. R1: *If x is A then z is C* 2. R2: *If y is B then z is C*	3	4
Q3	Two fuzzy sets P and Q are defined on x as follows. <table><tr><td>μ(x)</td><td>x₁</td><td>x₂</td><td>x₃</td><td>x₄</td><td>x₅</td></tr><tr><td>P</td><td>0.1</td><td>0.2</td><td>0.7</td><td>0.5</td><td>0.4</td></tr><tr><td>Q</td><td>0.9</td><td>0.6</td><td>0.3</td><td>0.2</td><td>0.8</td></tr></table> Find the following: (a) $P_{0.2}$, $Q_{0.3}$ (b) $(P \cup Q)_{0.6}$ (c) $(P \cup P)_{0.8}$ (d) $(P \cap Q)_{0.4}$	3	4
Q4	(i) Justify which of the two functions AND or XOR are linearly separable and which one is linearly non separable using truth table? (ii) Why can't a single-layer perceptron solve the XOR problem? (iii) How does a multilayer neural network solve XOR?	4	[4+2+2]
Q5	(i) A neural network is training but the error is not decreasing. List possible reasons.	4	5

	(ii) Why do we use derivative of activation function in backpropagation?		
Q6	(i) For the following function, identify if the critical point is a minimum, maximum, or saddle: $$f(x)=x^3$$ (ii) Find all extreme points of the function: $$f(x)=x^3-6x$$	5	5
Q7	Solve the following primal and verify using duality principle: Primal: $$\text{Maximize } Z = 4x_1+3x_2$$ Subject to: $$2x_1+x_2 \leq 10$$ $$x_1+x_2 \leq 8$$ $$x_1, x_2 \geq 0$$	5	5